know Latin, not to write Latin verses in imitation of Vergil, but to speak it or to read the latest work on theology or tactics or geography. The introduction of Greek into the curriculum of schools came with the Renaissance, but was not, as is often suggested, responsible for the birth of the new learning. Greek was introduced into Winchester and Eton, New College and Magdalen, in the fifteenth century, because these schools and colleges were the advanced institutions of the day, and their scholars the leading humanists of their age, eager for new light. Humanism then meant the substitution of new teaching for old, and its followers aimed at moulding "the nature of man as a citizen, an active member of the State," rather than at continuing the studies of doctrines relating to the next world upon which the attention of educated mankind had been concentrated for a thousand years.

We want to see a like recognition of the need of scientific knowledge on the part of the humanists of to-day, in the place of that attitude of obscurantism which they present to it. We want to make science the keynote of our Public School and University system, as Humboldt and others did in Prussia at the beginning of the nineteenth century, when Germany was under the heel of Napoleon; for to it are due the position and power gained by that country since then. The lesson which the French learnt from their disaster in 1870 was that attention must be given to education at every stage, and more especially to higher education, in order to secure their position most effectively. Are we to await like defeat before taking the necessary steps to ensure that our legislators, governing officials, and others who exert the highest influence in the State receive the scientific education which modern life demands?

CATALYSIS.

Text-books of Chemical Research and Engineering. Catalysis and its Industrial Applications. By E. Jobling. Reprinted from *The Chemical World.* Pp. viii+120. (London: J. and A. Churchill, 1916.) Price 2*s.* 6*d.* net.

THIS little book consists of a series of articles originally contributed to *The Chemical World,* and deals with a class of phenomena which have attracted special attention of late years owing to their growing importance in many operations of chemical technology. The fact that certain chemical processes can be initiated or greatly accelerated by the presence of some foreign material which *apparently* remains unchanged was recognised in the early part of the last century and denoted by the term *catalysis,* first applied by Berzelius in 1835. One of the earliest facts which is brought to the knowledge of the chemical tyro is the influence of manganese dioxide in promoting the disengagement of oxygen from potassium chlorate, and if he ponders at all upon the circumstance one of his earliest impressions must be of the inadequacy or unsatisfactory nature of the explanation of the cause of the phenomenon. But as his knowledge increases he learns to recognise that the influence of extraneous substances in promoting chemical change is in reality a very common phenomenon. At the same time, comparatively little is known of the mechanism of these catalytic actions. In a few cases it has been definitely ascertained that the catalytic agent does experience a series of changes. During the course of a reaction it is being continually decomposed and recomposed, and by suitable means the presence of the intermediate product can be detected. Hence it is reasonable to suppose that all catalytic phenomena depend upon the alternate decomposition and recomposition of the catalytic agent. Another curious fact brought to light by the industrial application of catalysis is that the activity of a catalytic agent may be wholly inhibited by the presence of another foreign body or, in the language of the technologist, of a so-called *poison.*

In Mr. Jobling's book much that is known of a rapidly developing subject has been brought together and described in a clear and interesting manner. In an introductory chapter he deals with the purely scientific aspects of catalysis and the characteristics of catalytic reactions, autocatalysis, pseudo-catalysis, etc. The rest of the book is concerned with the industrial applications of catalytic agents, as, for example, in the manufacture of sulphuric acid by so-called contact processes; of chlorine and salt-cake by Deacon and Hasenclever's process and the methods of Hargreaves and Robinson; of sulphur recovery by the Claus-Chance and Gossage processes; of the fixation of atmospheric nitrogen by the Haber and Ostwald's processes, etc.; of surface actions as illustrated by the work of Bone and his co-workers on surface combustion; incandescent gas-mantles, etc.; of hydrogenation, the work of Sabatier and Senderens and its application to the "hardening" of oils—a phenomenon of the greatest practical utility. Lastly, we have two short chapters on dehydrogenation and oxidation; and on dehydration, hydrolysis, etc., interesting as serving to throw light upon a variety of complex reactions depending apparently upon catalytic agencies, and as suggesting their applications in technical processes.

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The book deserves the serious attention of every student of chemistry. It will open his eyes to the boundless possibilities of a field of inquiry of which even the very fringes have only been very imperfectly explored as yet, but which, there is no doubt, is destined to yield fruit of the greatest richness and value.

THE STUDY OF VARIABLE STARS.

An Introduction to the Study of Variable Stars. By Dr. C. E. Furnesa. Pp. xx+327. (Boston and New York: Houghton Mifflin Co., 1915.) Price 1.75 dollars net.

IT has been said that it is more important to measure the light than the place of a star. Add the time factor and there is the observational province of the student of variable stars, namely, the measurement of the relationship between time and lustre of particular stars. The present book is largely given up to explaining methods by which this can be accomplished The author is one who has had almost unique opportunities fitting her to undertake the task, which might have been more successfully carried out had the aim been more ambitious. As director of Vassar College Observatory, Dr. Caroline Furness has not only actively engaged in variable star observation, but has also conducted the regular courses of study in this special subject in the astronomical department of the College. These occupations have ensured the necessary documentation and provided valuable experience in the practice of stellar observation, in the art of exposition, and especially in the needs of novices in this important branch of sidereal physics. The volume, it may here be mentioned, finds a place in the "Semi-centennial Series" of works by distinguished alumni issued in commemoration of the fiftieth anniversary of the foundation of Vassar, and at present it stands alone in the English language.

The intention of the work is primarily to *make* observers, and the practical side of the subject is kept prominently to the fore throughout. The historical aspect, however, receives considerable attention, and much interesting material has been collected. With the first aim in view the author attempts to supply the reader with concise information on a range of preliminary subjects such as "Durchmusterung charts," "photometry in all its branches," "spectroscopy," "star colours," etc. These efforts lead to a tedious description of star maps and charts, a summary of the rudiments of spectrum analysis, a lengthy non-technical account of Nichol's prism, taken, it would seem, from a well-known English text-book of physics, and, among other things, to the inclusion of an abstract of a paper on the physiological optics of the colours of double stars. This paper is sufficiently interesting, but it would have been better to describe the work of Hertzsprung, for example, or that of Tikoff; and instead of introducing the gentle gibe at the fanciful colour scheme employed in such an ancient work as Webb's "Celestial Objects," Espin's or Frank's colour scales might have received mention.

Although the title admittedly affords the author considerable liberty in choice of material, yet, since in these days the historical scale of star magnitudes has been everywhere abandoned, perhaps the sole important exception being the catalogue of Boss, there might well have been given some account of the absolute scale of magnitude adopted by the astrographic conference in 1909, especially as this crowned the thirty years' work of an American astronomer, Prof. E. C. Pickering.

So much attention is now being claimed by photo-electric photometry that many who cannot turn to the original memoirs will read the chapter on this topic with interest. As no account is given of work on, or with, selenium prior to that of Stebbins, it may be permissible to recall some facts not so widely known as they deserve to be. Announced by Mr. Willoughby Smith early in 1873, a little later Lieut. Sale, R.E., investigated quantitatively the effect of varied illumination on the conductivity of that element, the property employed in the commercial selenium bridges used in 1907 by Stebbins with such great success. Three years after Sale's experiments, Prof. Adams and Mr. R. E. Day detected the potential difference set up under similar conditions. The late Prof. G. M. Minchin applied this fact nineteen years later, in 1895, in what would appear to have been the first successful photo-electric measures of stellar radiation ever made.

It is rather to be regretted that space was not found for some discussion of the classification of variable stars instead of merely stating that the Harvard scheme is best known and most widely used. It may be, but it bears much the same relationship to present-day knowledge of stellar variability that Secchi's classification does to the Harvard classification of stellar spectra.

The later history of Novæ is even more interesting than would appear from p. 255. It has now been established that in their latest phases several, at any rate, have assumed the Wolf-Rayet features after passing through the nebular stage. It may here be mentioned that the note on p. 36 does not contain Prof. Fowler's latest conclusions regarding the Pickering and the

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